INSTRUCTION MANUAL

AND

PARTS LIST

FOR

GGG3D SERIES PUMPS

⚠	WARNING
This Instruction Manual and General Instructions Manual, CA-1, should be read thoroughly prior to pump installation, operation or maintenance.	

Manual No. SRM00097	**Rev. 05 (20-0051)**	**JULY, 2020**

READ THIS ENTIRE PAGE BEFORE PROCEEDING

FOR SAFETY OF PERSONNEL AND TO PREVENT DAMAGE TO EQUIPMENT, THE FOLLOWING NOMENCLATURE HAS BEEN USED IN THIS MANUAL:

DANGER

Failure to observe precautions noted in this box can result in severe bodily injury or loss of life.

WARNING

Failure to observe precautions noted in this box can cause injury to personnel by accidental contact with equipment or liquids. Protection should be provided by user to prevent accidental contact.

CAUTION **ATTENTION**

Failure to observe precautions noted in this box can cause damage or failure of equipment.

Non-compliance of safety instructions identified by the following symbol could affect safety for persons:	Safety instructions where electrical safety is involved are identified by:	Safety instructions which shall be considered for reasons of safe operation of pump and/or protection of pump itself are marked by the sign:
		ATTENTION

ATTENTION

If operation of pump is critical to your business, we strongly recommend you keep a spare pump or major repair kit in stock at all times. As a minimum, a minor repair kit (o-rings, gaskets, shaft seal and bearings) should be kept in stock so pump refurbishment after internal inspection can be accomplished.

CONTENTS

A. GENERAL INSTRUCTIONS

Instructions found herein cover disassembly, assembly and parts identification of GGG3D series pumps.

NOTE: **Individual contracts may have specific provisions that vary from this manual. Should any questions arise which may not be answered by these instructions, refer to the General Instructions Manual, CA-1, provided with your order. For further detailed information and technical assistance please refer to Imo Pump, Technical/Customer Service Department, at (704) 289-6511.**

This manual cannot possibly cover every situation connected with installation, operation, inspection, and maintenance of equipment supplied. Every effort was made to prepare text of manual so that engineering and design data is transformed into most easily understood wording. Imo Pump must assume personnel assigned to operate and maintain supplied equipment and apply instruction manual have sufficient technical knowledge and are experienced to apply sound safety and operational practices which may not be otherwise covered by this manual.

In applications where equipment furnished by Imo Pump is to become part of processing machinery, these instructions should be thoroughly reviewed to ensure proper fit of said equipment into overall plant operational procedures.

⚠ **WARNING**

If installation, operation, and maintenance instructions are not correctly and strictly followed and observed, injury to personnel or serious damage to pump could result. Imo Pump cannot accept responsibility for unsatisfactory performance or damage resulting from failure to comply with instructions.

B. INTRODUCTION

This instruction manual covers series GGG3D Imo pumps. This series of pumps has been designed for use in high inlet pressure, lubricating, seal oil applications. Model and design construction of each pump can be identified by designator code on pump nameplate. Definitions of model designators are identified in figure 1.

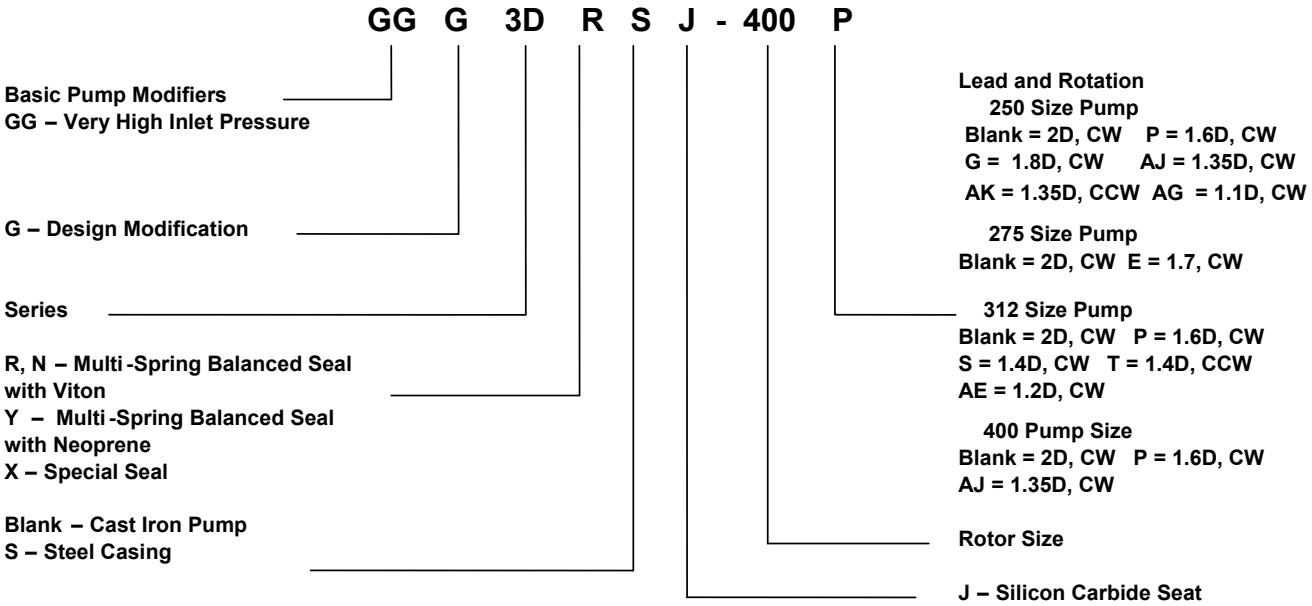
C. DESCRIPTION OF EQUIPMENT

GGG3D Series pumps are positive displacement, rotary screw pumps consisting of a precision bored housing which encloses a driven screw (power rotor) and two intermeshing following screws (idler rotors). These screws when rotating form a succession of closures or cavities. As they rotate, fluid is moved axially from inlet port to outlet port in a continuous, uniform flow with minimum fluid pulsation and pump noise.

D. PUMP MODEL IDENTIFICATION

This instruction manual covers Imo Series GGG3D pumps. The model of each pump is identified on pump nameplate. Refer to figure 1 and table 2 for instructional keys when using this manual.

Figure 1 – Model Designator Definitions



E. ORDERING INSTRUCTIONS

When corresponding with Imo Pump regarding Series GGG3D series pumps, refer to pump nameplate, this instruction manual, and assembly drawing as instructed below:

1. From pump nameplate, record pump model number, serial number, and manufactured date.
2. Record instruction manual number, revision, and date.
3. From instruction manual, record figure numbers that apply to replacement part(s).
4. From assembly drawing or parts list (see table 2) provide IDP number(s) and names for replacement part(s).
5. Give above information to your Imo service representative.

Imo sales and service representatives are listed herein and in General Instruction Manual, CA-1.

F. OPERATION

F.1 LIQUID LIMITATIONS

Never operate with thin liquids such as solvents or water. Pump is designed for liquids having general characteristics of oil.

F.2 OPERATING LIMITS

CAUTION	ATTENTION
Operating conditions, such as speed, fluid viscosity, temperature, inlet pressure, discharge pressure, filtration, duty cycle, drive type, mounting, etc., are interrelated. Due to these variable conditions, specific application limits may be different from operational limitations. Equipment must not be operated without verifying system operating requirements are within pump's capabilities.	

Under no circumstances are the following operating limits (specified in table 1) to be exceeded without specific approval from Imo Pump.

Table 1 – Normal Pump Operating and Structural Limits

Condition	Limit
Maximum Speed	3500 rpm For Size 250 2500 Rpm for Sizes 275, 312, 400
Viscosity Range	32 SSU to 15000 SSU
Liquid Temperature Range	0°F to 250°F
Maximum Inlet Pressure	400 psig
Maximum Discharge Pressure (Continuous Duty)	500 psig
Filtration	Refer to General Instruction Manual, CA-1
Drive	Direct or Belt
Mounting	Foot mounted in any attitude

G. PARTS LIST

Table 2 – Pump Parts List

IDP	QTY	DESCRIPTION	KIT		IDP	QTY	DESCRIPTION	KIT
1	1	Case			23	2	Thrust Hex Cap Screws	
2	1	Housing	XX		24	2	Thrust Plate Washer	
3	1	Seal Vent Plug (All Sizes but 400)			25	1	Mechanical Seal	X
4	1	Anti-Rotation Tube	XX		26	1	Inlet	
5	2	Tube O-ring	X		27	1	Tube Spacer (250 Only)	
6	2	Housing O-ring	X		28	1	Housing Spacer (275 and 400 Only)	
7	1	Inboard Cover O-Ring	X		30	16	Outlet Washers (400 Only)	
8	1	Inlet O-ring	X		31	1	Pin Stop (400 Only)	XX
9	1	Inboard Cover	XX*		33	1	Fastener Seal (400 Only)	X
10	8	Inlet Hex Bolts			38	1	Seal Spacer (Not 312)	
11	1	Power Rotor	XX		44	1	Seal Seat Adapter O-ring	X
12	8	Seal Spacer Set Screws (250 Only)			46	4	Thrust Spacer O-Rings (312 Only)	XX
13	1	Retaining Ring	X		67	4	Pipe Plugs	
14	1	Spacer/Seal Seat Adapter			86	1	Bushing (275 Only)	XX
15	1	Bearing	X		92	1	Seal Spacer O-ring (250 Only)	X
16	1	Key			93	8	Front Cover Hex Bolts (Except 312 Size)	
17	1	Bearing Retainer			94	1	Bearing Lockwasher	X
18	4	Bearing Retainer Hex Bolts			96	1	Bearing Locknut	
19	2	Idlers	XX		97	1	Bearing Spacer Set	
20	2	Idler Cups	XX		98	1	Balance Piston Housing (Except 312 Size)	XX**
21	1	Thrust Plate	XX		99	1	BP Housing O-ring (275 and 250 Only)	X
22	2	Thrust Spacers			100	1	Nilos Ring	X

X = Minor Repair Kit Items. XX=Major Repair Kit Items. (Items marked (X) included in Major Repair Kit.)
XX* = Only required in 250 size major kit
XX** = Only required in 275 and 400 size major kit

H. PUMP MAINTENANCE

WARNING

Failure to observe precautions while installing, inspecting, and maintaining pump can cause injury to personnel from accidental handling of liquids that may harm skin or clothing, or fire hazard risks from flammable liquids, or injury from high pressure fluid jets.

DANGER

BEFORE working on equipment, make sure all power to equipment is disconnected and locked-out.

H.1 GENERAL COMMENTS

NOTE: Part number identifiers (IDP) contained within parenthesis, such as (9), refer to circled numbers shown on assembly drawing.

De-energize driver before starting with any maintenance action.

H.2 TOOLS REQUIRED

Procedures described in this manual require common mechanics hand tools, a torque wrench, dial indicators for alignment and a suitable lifting device such as slings, straps, etc.

H.3 Pump Disassembly:

Determine pump model on pump nameplate to select applicable pump assembly shown in Figures 2, 3, 4, or 5. Refer to that assembly for the following instructions.

NOTE: GGG3D pumps incorporate highly finished precision parts that must be handled carefully to avoid damage to critical machined surfaces. Parts removed should be tagged for identification and their exact positions in pump carefully noted so that new parts, or same parts, are properly replaced without damage

CAUTION

Fluid leakage from disassembly of pump may make floor slippery and cause personal injury.

SPECIAL NOTE: To service mechanical seal and ball bearings ONLY perform H.3, Steps 1, 8, 9, 10 and 11 and H.4, Steps 18 thru 21 ONLY.

1. Close suction and discharge piping to pump. Vent pressure from pump. Disconnect piping. Remove drain plugs (67) and drain unit. Remove pump from driver, coupling and base plate. Remove coupling hub and key (16).

2. Remove inlet head (26) from case (1) by removing bolts (10) (and lockwashers (30) on size 400 only). Remove and discard O-ring (8) from inlet head (26). Remove spacer (28) on sizes 275 and 400).

3. Remove thrust plate (21) and spacers (22) by removing bolts (23) and lock washers (24).

4. If pump is 400 size, remove O-rings (46) from inside spacers (22).

5. Remove cups (20) from idlers (19).

6. Remove idlers (19) from housing (2) by unscrewing them from housing bores.

CAUTION **ATTENTION**

Do not permit idlers (19) to drop as they emerge from housing (2).

7. On 400 size only, Remove pin stop (31) and fastener seal (33) from case (1).

8. Remove bearing retainer (17) from inboard cover (9) by removing bolts (18).

9. Remove assembled power rotor (11) from inboard cover (9). Removal of power rotor (11) includes removal of snap ring (13), ball bearings (15), seal seat adapter (14), spacer (38) (Not on 312), spacer (38) O-ring ((92) 250 size only), bearing lockwasher (94), bearing nut (96), bearing spacer set (97), nilos ring (100) and mechanical seal (25).

10. Disassemble power rotor (11) as follows:

    a. Using a spanner wrench, remove bearing locknut (96) and bearing lockwasher (94).

    b. Ball bearings (15) are assembled to power rotor (11) with light press fit. They may be removed with either bearing puller or vertical arbor press. When using press, set power rotor (11) vertical with side of seal seat adapter (14) nearest O-ring (44) on press. Position press ram against power rotor (11) coupling end face. Gently press power rotor (11) through ball bearing (15) until snap ring (13) moves away from, bearing (15). Remove snap ring (13). Continuing pressing shaft through outer bearing until outer bearing is free. Remove bearing spacer set (97). Continue pressing shaft until inner bearing is free. Ensure power rotor (11) does not fall to floor once ball bearing (15) is off of its diameter).

    c. Remove seal seat adapter (14) with stationary seal seat from shaft (11). Remove stationary seat with O-ring from seal seat adapter (14).

    d. On sizes 275, 312 and 400, remove rotating seat of seal (25) from shaft after undoing setscrews on seal and then if pump is 275 or 400 size, remove or seal spacer (38). If pump is 250 size, remove seal (25) after loosening set screws in seal (25). Then remove spacer (38) after loosening set screws (12). Finally remove O-ring (92)

11. Remove O-ring (44) from inboard end cover (9).

12. Remove inboard cover (9) by removing bolts (93) or ((10) on 312 size) and washers ((30), on size 400 only)).

13. Remove and discard O-ring (7) from inboard cover (9).

14. Remove balance piston housing (98) with O-ring (99 ((6) on size 400)) on all sizes except 312. This can be accomplished by pushing on suction end of housing (2) until balance piston (98) emerges.

15. On all sizes but 312, remove and discard balance piston O-ring (99) or ((6) on size 400).

16. Remove spacer (27) on size 250 only. Remove tube (4) with O-rings (5) from housing (2) or balance piston housing (98). Discard O-rings (5).

17. Remove housing (2) and O-ring (6) from discharge end of case (1). Discard O-ring (6).

H.4 PUMP ASSEMBLY

NOTE: Prior to reassembly of pump, clean and inspect all parts for nicks and burrs. Replace all worn or damaged parts. Imo Pump recommends replacement of all O-rings, gaskets mechanical seal and ball bearing when these parts are disturbed from their previously installed positions. Coat all parts with light lubricating oil to assist in assembly.

1. If pump is a 250 or 275 size, proceed to step 2 below. If pump is a 312 skip to step15. If pump is a 400 size skip to step 9.

2. Install O-rings (5) on tube (4) and tube (4) in balance piston housing (98).

3. Install O-ring (99) on balance piston housing (98) and then balance piston housing (98) in case (1). Be sure to line up bolt holes in balance piston housing (98) so that tube (4) is in a vertically, facing up position.

4. Install O-rings (7) onto back of balance piston housing (98) and then install inboard cover (9) into case (1) with bolts (93). Be sure seal drain hole (3) is in a vertically facing up position. Torque bolts to value on appropriate assembly drawing.

5. Install spacer (27) on tube (4) if pump is 250 size.

6. Install O-ring (6) in groove in housing (2). Install housing (2) O-ring end first, in pump case (1) from suction end and push it in as far a possible. Be sure that hole in housing (2) lines up with tube (4) in balance piston housing (98).

7. Install spacer (28) in case (1) if pump is 275 size.

8. Skip to step 18.

9. Install O-ring (6) in groove in housing (2). Install housing (2) O-ring end first, in pump case (1) from suction end and push it in as far a possible being sure that stop pin (31) hole lines up with anti-rotation hole in housing (2). Install fastener seal (33) and stop pin (31) in case (1) being sure that goes into anti-rotation hole in housing (2).

10. Install spacer (28) in case (1).

11. Install O-rings (5) on tube (4) and tube (4) in housing (2).

12. Install O-ring (6) on balance piston housing (98) and then balance piston housing (98) in case (1) being sure that tube (4) in housing (2) lines up with hole in balance piston housing (98).

13. Install O-rings (7) onto inboard cover (9) and inboard cover (9) into case (1) with washers (30) and bolts (93). Be sure seal drain hole (3) is in a vertically facing up position. Torque bolts to value on appropriate assembly drawing.

14. Skip to step 18.

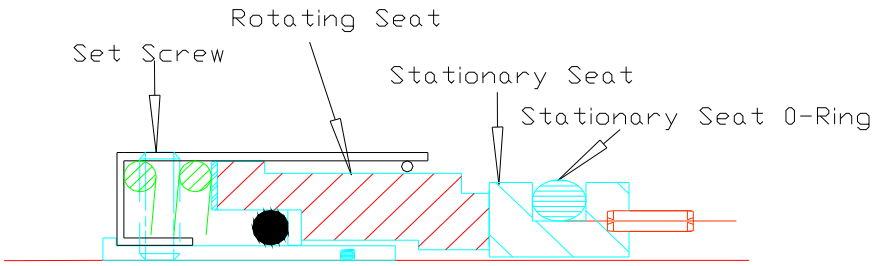
15. Install O-rings (5) on tube (4) and tube (4) in inboard cover (9).

16. Install O-ring (7) on inboard cover (9) and I inboard cover (9) in case (1) using bolts (10). Be sure seal drain hole (3) is in a vertically facing up position. Torque bolts to value on appropriate assembly drawing.

17. Install O-rings (6) onto housing (2). Install housing (2) into case (1) being sure that tube (4) in inboard cover (9) lines up with hole in housing (2).

18. Inspect power rotor (11) shaft and remove any nicks or burrs which are present. Polish power rotor shaft to remove any rust or oxidants that may be present under shaft sleeve. Imo pump recommends replacement of ball bearing (15), mechanical seal (25), and all O-rings when these parts are disturbed from their original installed position. All parts should be coated with light lubricating oil to assist in assembly.

19. Assemble power rotor (11) and mechanical seal (25) as follows:



a. If pump is a 250 assemble O-ring (92) in groove in shaft (11) Screw setscrew (12) into seal spacer (38) and install seal spacer (38) on shaft (11). Tighten setscrew (12). If pump is a 275 or 400 size, slide spacer (38) onto shaft (11). The 312 size has no spacer

b. Coat O-ring in sleeve of rotating seat, or O-ring on rotating seat of seal on 250 size seal, with system fluid and slide mechanical seal rotating assembly, or rotating seat on size 250, on power rotor (11) until it seats against shoulder of seal spacer (38) or power rotor balance piston on 312 size. Tighten rotating seat set screw. Wipe seal face with isopropyl alcohol and lint free cloth.

c. Install O-ring in groove of mechanical seal stationary seat. Install seat including O-ring in seal seat adapter (14) ensuring that groove in back of stationary seat mates to spring pin in seal seat adapter (14). Clean seal face with isopropyl alcohol and lint free rag. Put a small amount of clean system fluid or light oil on seal running face. Install rotating face of seal in seal seat adapter (14) against stationary seat face.

d. Install inner snap ring (13) in groove of power rotor (11).

e. Install nilos ring (100) on seal seat adapter (14).

CAUTION **ATTENTION**

In next step you will install bearings on shaft. Be sure to used cylindrical sleeve to press only on inner race when installing bearing. Pressing on outer race could damage bearing.

CAUTION **ATTENTION**

In next step you will also be greasing ball bearings. Bearing should be approximately 1/3 full of grease. Over greasing bearing can lead to overheating and damage to bearing.

f. Put the thread section of power rotor (11) on a press and press inner ball bearing (15) onto power rotor (11) pressing only on inner race of ball bearing, using an installation sleeve, until ball bearing is located next to snap ring (13). Fill bearing approximately 1/3 full of Royco 13 or equivalent bearing grease.

g. Install spacer set (97) on shaft (11). Fill spacer set approximately 3/4 full of Royco 13 or equivalent bearing grease.

h. Install outer ball bearing (15) onto power rotor (11) pressing only on inner race of ball bearing using an installation sleeve until it located next to spacer set (97). Fill bearing approximately 1/3 full of Royco 13 or equivalent bearing grease.

i. Install bearing lock washer (94) and then screw on bearing lock nut (96) with spanner wrench until it is a tight as possible without using an extension on spanner wrench. (At least one of tangs in lock washer (95) must line up with one of grooves in lock nut (96). Bend tang from lock washer (94) into groove in locknut (96).

20. Install O-ring (44) into inboard cover (9) and then assembled power rotor (11) into inboard cover (9).

21. Install bearing retainer (17) onto inboard cover with hex bolts (18). Torque bolts to value on appropriate assembly drawing.

22. Install idlers (19) into housing (2) by meshing threads with power rotor thread.

23. Install idler cups (20) on idlers (19).

24. Install bolts (23) and lock washers (24) in thrust plate (21). Install spacers (22) on bolts (23).

25. Install thrust plate assembly including thrust plate (21), washers (24), bolts (23) and spacers (22) on housing (2). Torque bolts (23) to value on appropriate assembly drawing.

26. Install O-ring (8) in groove in inlet head (26).

27. Install inlet head (26) using bolts (10) (and lockwashers (30) if size 400). Torque bolts to value on appropriate assembly drawing.

28. Install drain plug (67) with Loctite.

NOTE: Inlet head (26) can be rotated and repositioned in 90 degree increments to suit suction piping. To change inlet position, remove bolts (10) and rotate inlet head to desired position. Install bolts (10) and torque to proper values indicated on assembly drawing.

29. Install coupling hub key (16). Install and align pump and driver as specified in General Instruction Manual, CA-1.

I. TROUBLESHOOTING

For assistance with troubleshooting see the General Instruction Manual, CA-1.

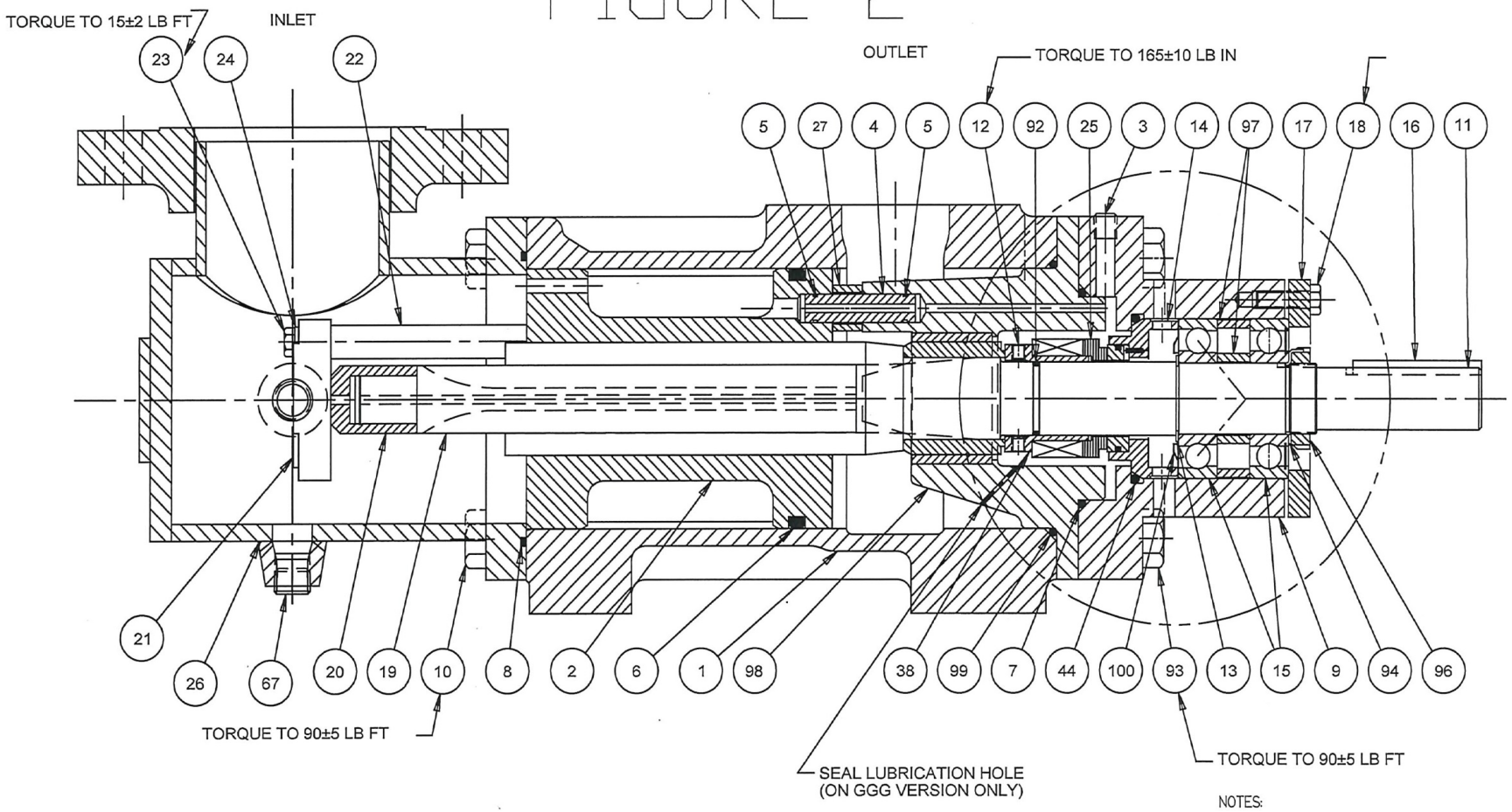
J. FIELD AND FACTORY SERVICE AND PARTS

Imo Pump maintains a staff of trained service personnel that can provide pump installation, pump start-up, maintenance/overhaul and troubleshooting supervision as well as installation and maintenance training.

Our factories provide maintenance as well as overhaul and test facilities the in event user prefers to return pumps for inspection or overhaul. Factory-overhauled pumps are normally tested and warranted “as-new” for a period of one year from date of shipment. For either field service or factory overhaul assistance, contact your local Imo Sales Office or representative at Technical/ Customer Service Department in Monroe, NC, USA.

Most pumps have repair kits available. Minor Repair Kits are used to repair leaking seals, bad bearings and/or for re-assembly after pump tear-down. They include (as applicable) pump shaft seals, packing, all gaskets/O-rings and bearings. Major Repair Kits are sufficient to rebuild completely worn-out pumps to “as-new” condition. They include all parts found in Minor Repair Kits plus all major internal parts subject to wear. Since kits have all necessary parts, kit purchase is preferred rather than selecting individual parts. When parts are individually selected from Parts List, some needed components are often overlooked. In addition, mixing worn or used parts with new parts risks rapid wear and shortened service life from new parts.

FIGURE 2

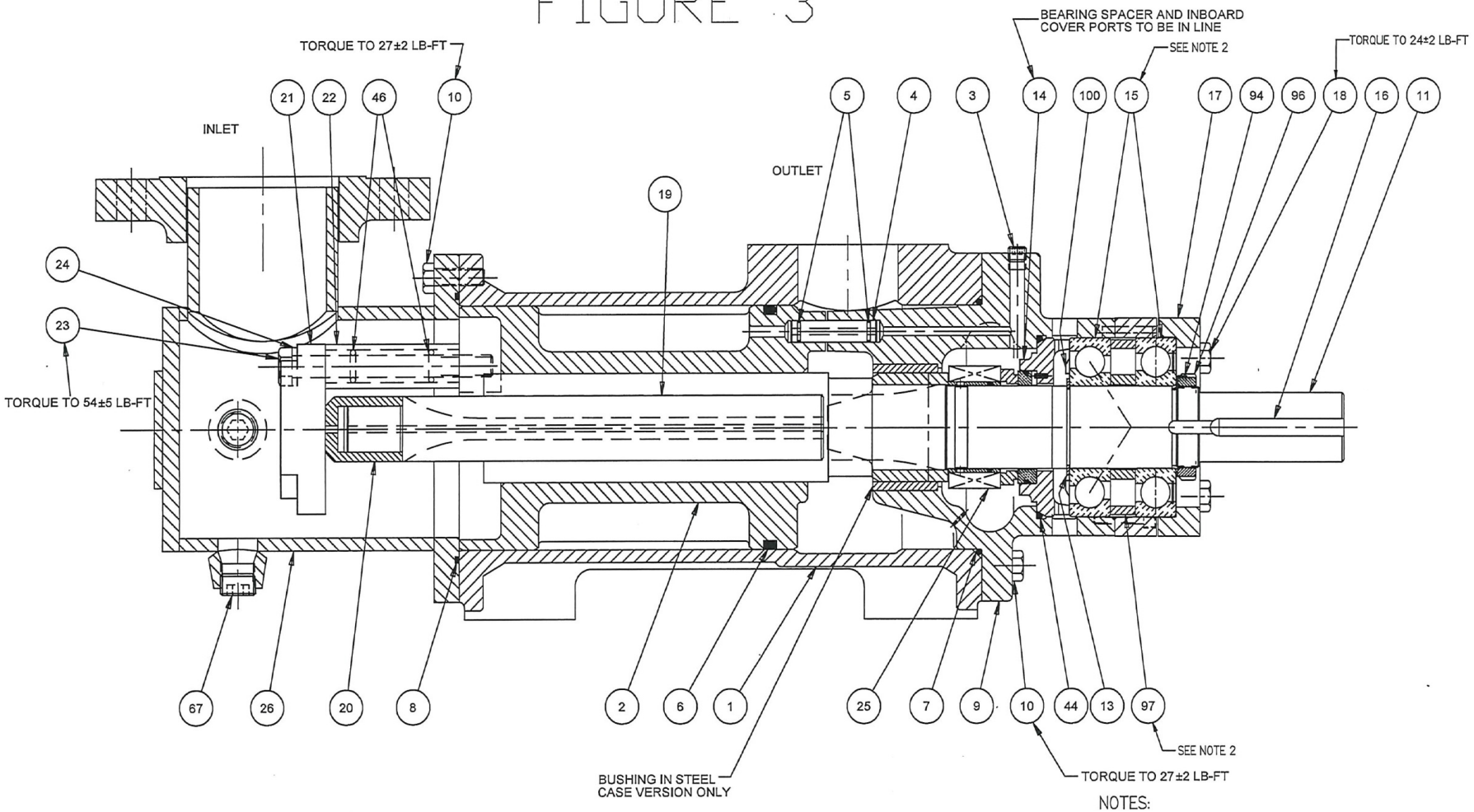


GGG3D_S_-250_ PUMP

NOTES:

1. BEARING (15) 1/3 FILLED AND SPACER (97) 3/4 FILLED WITH ROYCO 22CF GREASE
2. ARROW ETCHED ON BEARING (15) TO BE FACING DIRECTION SHOWN ON DRAWING
3. SLOT IN SPACER (14) TO LINE UP WITH HOLES IN COVER (9)

FIGURE 3

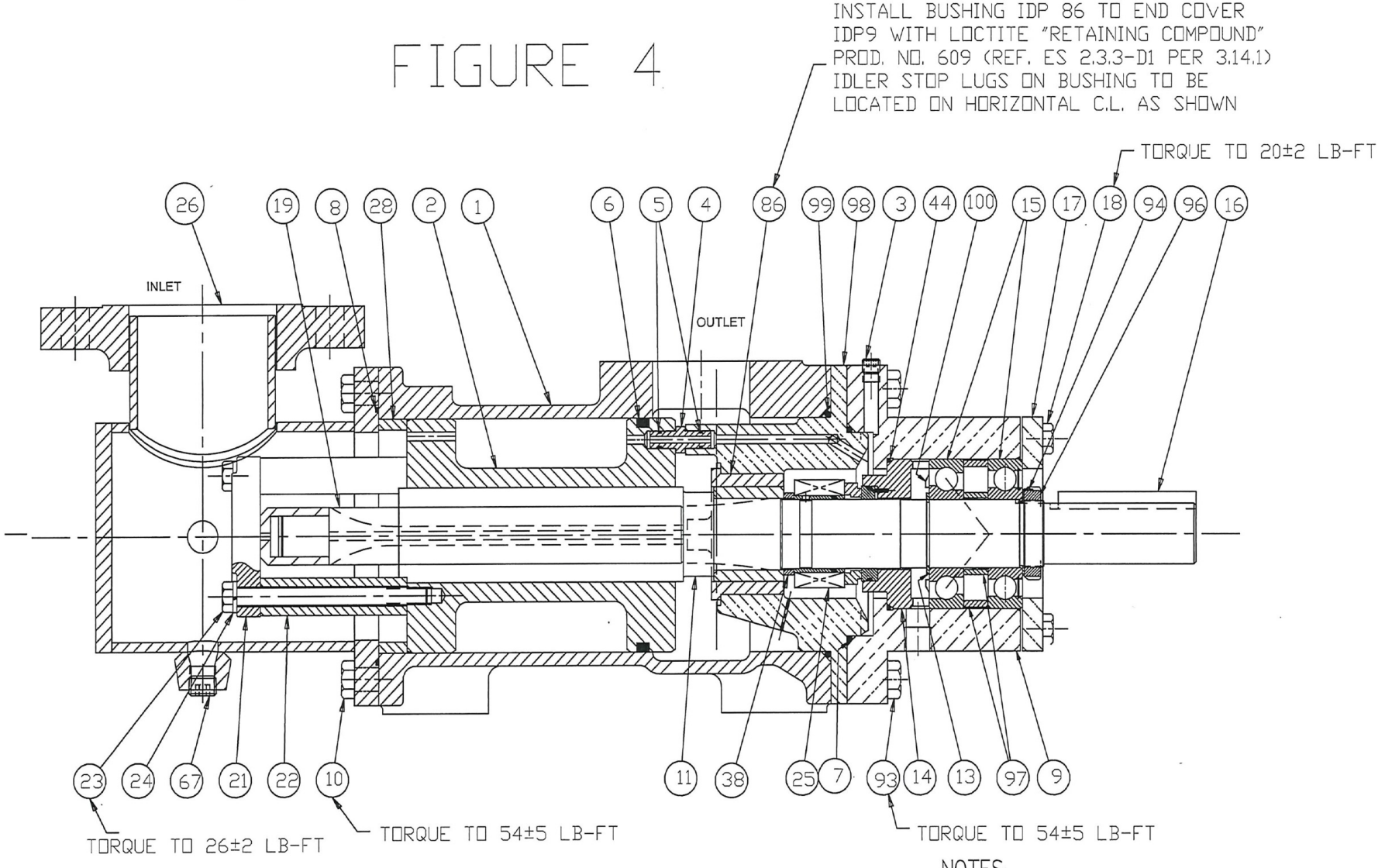


GGG3D_-312_ PUMP

NOTES:

1. BEARING (15) 1/3 FILLED AND SPACER (97) 3/4 FILLED WITH ROYCO 22CF GREASE
2. ARROW ETCHED ON BEARING (15) TO BE FACING DIRECTION SHOWN ON DRAWING
3. SLOT IN SPACER (14) TO LINE UP WITH HOLES IN COVER (9)

FIGURE 4

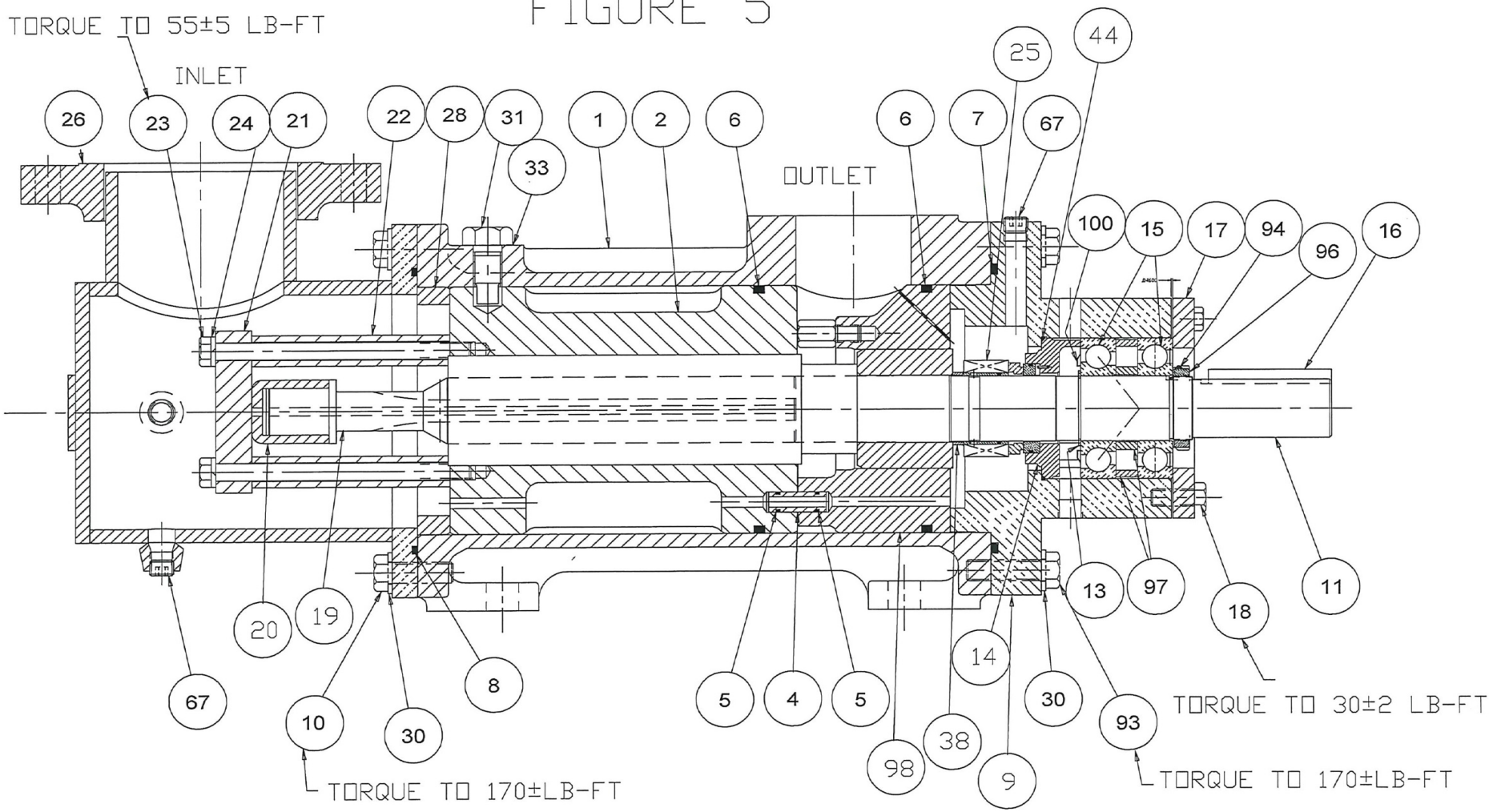


GGG3D_-275_ PUMP

NOTES:

1. BEARING (15) 1/3 FILLED AND SPACER (97) 3/4 FILLED WITH ROYCO 22F GREASE
2. ARROW ETCHED ON BEARING (15) TO BE FACING DIRECTION SHOWN ON DRAWING
3. SLOT IN SPACER (14) TO LINE UP WITH HOLES IN COVER

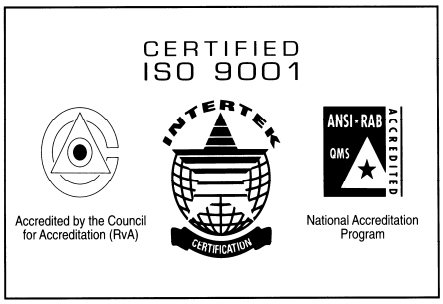
FIGURE 5



NOTES:

1. BEARING (15) 1/3 FILLED AND SPACER (97) 3/4 FILLED WITH ROYCO 22CF GREASE
2. ARROW ETCHED ON BEARING (15) TO BE FACING DIRECTION SHOWN ON DRAWING.
3. SLOT IN SPACER (14) TO LINE UP WITH HOLES IN COVER (9)

GGG3D_-400_ PUMP



CIRCOR
1710 Airport Road
PO Box 5020
Monroe, NC USA
28111.5020

Tel: +1.877.853.7867

Email: cc@circor.com
Web: www.circorpt.com

CIRCOR | IMO®